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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/04/2002

Ralf Heidler

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07/13/2004

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EXAMINER

VARGAS, DIXOMARA

ART UNIT

PAPER NUMBER

2859

DATE MAILED: 07/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/065,334	Applicant(s) HEIDLER, RALF	
	Examiner Dixomara Vargas	Art Unit 2859	<i>an</i>

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 May 0504.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>20040505</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8, 10-13, 18-22, 24-25, 30-32, 35 and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Sun et al. (US 6,121,774 A).

With respect to claims 1 and 31, Sun discloses a method for reducing a spurious signal in a nuclear magnetic resonance (NMR) measurement, comprising (Abstract): inducing a static magnetic field in a volume to polarize spins of nuclei therein (Column 3, lines 42-44), inducing an RF magnetic field in the volume in accordance with a pulse sequence; acquiring a sequence of signals generated in the volume in response to the pulse sequence, each signal in the acquired sequence including a spurious signal component and a spin echo component (Column 3, lines 44-59), combining at least a first signal and a second signal of the acquired sequence, thereby generating a corrected signal having a reduced spurious signal component (Column 5, lines 1-54).

3. With respect to claims 2, 18, 20, 30, 32 and 40, Sun discloses the step wherein the corrected signal is generated from a linear combination of at least the first signal and the second signal (Column 5, lines 1-54).

4. With respect to claim 3, Sun discloses the step wherein the linear combination is the average of at least the first signal and the second signal (Column 5, lines 1-54).
5. With respect to claims 4, 42 and 44, Sun discloses the step wherein the second signal is adjacent the first signal in the acquired sequence (Column 5, lines 1-54).
6. With respect to claims 5, 41, 43 and 45, Sun discloses the step wherein the second signal is a next nearest neighbor of the first signal in the acquired sequence (Column 5, lines 1-54).
7. With respect to claim 6, Sun discloses the step wherein a time delay between the first signal and the second signal in the acquired sequence is less than 10 milliseconds (Figure 4a).
8. With respect to claim 7, Sun discloses the step wherein a time delay between the first signal and the second signal in the acquired sequence is in the range of 0.5 to 5 milliseconds (Figure 4a).
9. With respect to claims 8 and 21, Sun discloses the step of computing an NMR parameter of the volume using the corrected signal (Column 4, lines 1-4).
10. With respect to claims 10, 11 and 22, Sun discloses the step of deriving a geological characteristic of the volume based on the computed NMR property wherein the geological characteristic is porosity (Column 1, lines 21-40).
11. With respect to claims 12 and 24, Sun discloses the step wherein the pulse sequence comprises a plurality of inversion pulses (Column 4, lines 44-50), and wherein at least one of the inversion pulses is phase alternated relative to the others (Column 3, lines 60-67).
12. With respect to claims 13 and 25, Sun discloses the step wherein the pulses of the pulse sequence are arranged to compensate for spin dynamics errors (Column 3, lines 37-67).
13. With respect to claim 19, see rejection of claims 1 and 12 above.

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14. With respect to claim 35, see rejection of claims 1-3, 8 and 12 above

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 9 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al. (US 6,121,774 A) in view of Sigal et al. (US 6,541,969 B2).

With respect to claims 9 and 33, Sun discloses the claimed invention as stated above in paragraph 5 except for the step wherein the NMR parameter is a T₂ distribution. However, Sigal discloses the T₂ distribution NMR parameter as a NMR measurement (Column 14, lines 23-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the T₂ distribution NMR parameter as a NMR measurement as taught by Sigal with Sun's method for reducing a spurious signal in a nuclear magnetic resonance (NMR) measurement for the purpose of determining from such measurements the porosity, permeability and hydrocarbon saturation of the geological formations which provides valuable information about the make-up of the geological formations and the amount of extractable hydrocarbons.

17. Claims 14-17, 23, 26-29, 34, 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al. (US 6,121,774 A) in view of Applicant's admitted prior art (AAPA).

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With respect to claims 14, 15, 26, 27, 36 and 37, Sun discloses the claimed invention as stated above in paragraph 5 except for the step wherein the pulse sequence comprises a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is six inversion pulses arranged to induce a phase pattern of six spin echo signals in accordance

with the following: $+X_1(-\tau) - X_2(+\tau) - X_3(-\tau) - X_4(+\tau) + X_5(-\tau) + X_6(+\tau)$ wherein the bold uppercase terms represent direction of the inversion pulses, and the italicized lowercase terms represent direction of the induced spin echo signals in a rotating frame of reference and wherein the linear combination is selected from the group consisting of:

$$(a) \quad lc_1 = \frac{1}{2}(e_1 + e_2) \quad i = 1, 4, 7, \quad j = 3, 6, 9, \dots$$

$$(b) \quad lc_2 = \frac{1}{2}(e_1 + e_3) \quad i = 2, 5, 8, \quad j = 3, 6, 9, \dots$$

$$(c) \quad lc_3 = \frac{1}{2}(e_1 + e_4) \quad i = 3, 6, 9, \quad j = 4, 7, 10, \dots$$

$$(d) \quad lc_4 = \frac{1}{2}(e_1 + e_5) \quad i = 3, 6, 9, \quad j = 5, 8, 11, \dots$$

wherein lc represents the linear combination, and e represents the induced spin echo signal.

However, applicant discloses the pulse sequence comprises a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is six inversion pulses arranged to induce a phase pattern of six spin echo signals in accordance with the previous mathematic equations (Pages 9-10; paragraphs 36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a pulse sequence comprising a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is six inversion pulses arranged to induce a phase pattern of six spin echo signals in accordance with the previous mathematic equations since applicant shows that said features are conventional and well known in the art.

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18. With respect to claims 16, 17, 28, 29, 38 and 39, Sun discloses the claimed invention as stated above in paragraph 5 except for the step wherein the pulse sequence comprises a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is three inversion pulses arranged to induce a phase pattern of three spin echo signals in accordance with the following: $\ast Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta)$ wherein the bold uppercase terms represent direction of the inversion pulses, and the italicized lowercase terms represent direction of the induced spin echo signals in a rotating frame of reference. However, applicant discloses a pulse sequence comprises a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is three inversion pulses arranged to induce a phase pattern of three spin echo signals in accordance with the following: $\ast Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta)$ wherein the bold uppercase terms represent direction of the inversion pulses, and the italicized lowercase terms represent direction of the induced spin echo signals in a rotating frame of reference (Page 10, Paragraph 39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a pulse sequence comprising a plurality of inversion pulses arranged in a repeating phase pattern, and wherein the repeating phase pattern is three inversion pulses arranged to induce a phase pattern of three spin echo signals in accordance with the following: $\ast Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta) - Y_1(\ast \gamma \delta)$ wherein the bold uppercase terms represent direction of the inversion pulses, and the italicized lowercase terms represent direction of the induced spin echo signals in a rotating frame of reference since applicant shows that said features are conventional and well known in the art.

19. With respect to claims 23 and 34, Sun discloses the claimed invention as stated above in paragraph 5 except for the step wherein the acquiring is performed while drilling the borehole.

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However, applicant discloses acquiring is performed while drilling the borehole as a known step for obtaining the measurements faster (Page 1, paragraph 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to acquire the data while drilling the borehole since applicant shows that said feature is conventional and well known in the art.

Response to Arguments

20. Applicant's arguments filed 4/14/04 have been fully considered but they are not persuasive.
21. Applicant argues that Sun does not teach or suggest applicant's claimed NMR signal ringing reduction that includes a combination of signals where "each signal...includes a spurious signal component and a spin echo component."
22. The examiner disagrees with applicant's arguments because Sun discloses a signal combination of spin echo component and spurious signal in a CPMG sequence wherein the undesired effects or spurious signals are the ringing noise and baseline shift and the spin echo components are signals produced by the refocusing pulses of the CPMG sequence. Furthermore, Sun discloses utilizing the RingKiller Approach for the purpose of correcting the signals from the undesired effect or ringing signals (Column 5, lines 1-36). If applicant intends to claim that the method combines two different signals in two different measurements, each composed of a spin echo component and a spurious signal, wherein both signals of said measurement are

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combined and then are corrected to suppress the spurious signal, applicant is reminded that the current claim language does not clearly recites such limitation.

23. Applicant argues that Sun does not teach or suggest that the combined signals are adjacent to each other.

24. The examiner disagrees with applicant's argument because Sun shows in figure 2 that the combined echo signal (#16) are adjacent to the ringing or undesired effects signals (#18).

Conclusion

25. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (571) 272-2252. The examiner can normally be reached on 8:00 am. to 4:30 pm..

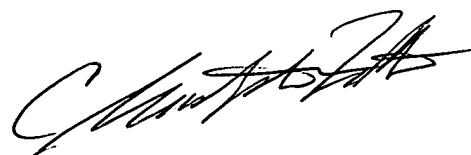
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Dixomara Vargas
Art Unit 2859
July 8, 2004



CHRISTOPHER W. FULTON
PRIMARY EXAMINER